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CASING FOR AN AIR SUCTION MACHINE

Inventor:	Rolf Füsser 76332 Bad Herrenalb (DE)
Applicant:	Filterwerk Mann & Hummel GmbH 71638 Ludwigsburg (DE)
Agent:	Gerhard Voth Filterwerk Mann & Hummel GmbH 71631 Ludwigsburg (DE)

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Abstract

A casing for an air suction machine, e.g., for a compressor 11 for a fuel cell drive 13 is prepared, this casing constituting a closed volume so that this volume can be utilized acoustically for the aspirated air. An air intake 17 is run into casing 12, consisting of a sound-muffling and sound-absorbing material 18 so that the resonance chamber 19 functions as a series resonator. The air is drawn in via air inlet 21 of compressor 11. Alternatively, the resonance chamber can

also be used as a parallel resonator in that the air intake path in casing 12 is designed to be closed and has communication openings only to the resonance chamber.

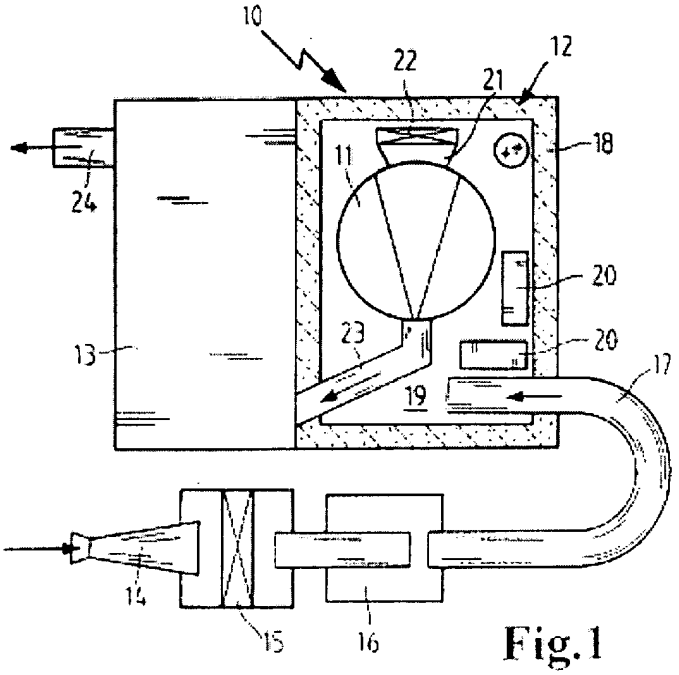

Fig. 1

[0001]

The invention relates to a casing for an air suction machine, in particular a compressor for a fuel cell drive, according to the preamble of Claim 1. The invention also relates to an assembly that also comprises, in addition to the casing, the air suction machine according to the preamble of Claim 2.

[0002]

It is known that devices that emit structure-borne sound can be provided with a casing that muffles the sound emitted by these devices and also absorbs it when jacketed with absorption material. The casings preferably consist of acoustic muffling materials that do not allow the sonic energy to pass through to the environment.

[0003]

Such casings nevertheless require additional free space. However, sound-emitting machines, e.g., the internal combustion engine or also the compressor for a fuel cell drive, are arranged in constricted installation spaces in the motor vehicle industry. If a described casing is provided, the installation space necessary for it must be reserved by reducing in size acoustically

active volumes in the intake path of the air suction machine. The casing therefore represents an acoustic compromise in most instances.

[0004]

The invention therefore has the problem of creating a casing for an air suction machine, or an assembly containing the casing and the air suction machine, in which the volume used for noise muffling should be capable of being utilized as optimally as possible. This problem is solved by the features of Claims 1 and 2.

Advantages of the invention

[0005]

The casing according to the invention completely surrounds the air suction machine. As a result, an optimal sound insulation of structure-borne sound emitted by the air suction machine can be achieved. The casing according to the invention is characterized in that it is completely sealed off from the environment, as a consequence of which the volume enclosed by it cannot communicate with the environment. As a result, a resonance chamber is formed that can only communicate with the air intake path of the machine. The volume enclosed by the casing can thus be used at the same time as an acoustically active volume for the intake noise of the air suction machine. As a result, the casing has a double function. The sound-muffling and sound-absorbing quality of the casing material and the resonator property of the enclosed volume can be utilized at the same time.

[0006]

The enclosed volume is rather large by comparison to the volumes otherwise available in the intake path for acoustic purposes. It is therefore particularly suitable for reducing low-frequency noise components in the intake noise. A complex geometry of the resonator volume results as a consequence of the structural components provided in the casing. A broadband reduction of noise considered over the frequency band of the intake noise is therefore achieved.

[0007]

The casing according to the invention is particularly suitable for compressors like those used in fuel cell drives. The requirements of a high volumetric effectiveness and the reduction of the ability of the air to absorb moisture result in the selection of compressors with a very high power density. These compressors emit, depending on their construction type, a loud noise at the intake mouth as well as via the housing walls. The casing of the invention is capable of blocking

the structure-borne sound through the housing walls of the compressor, as well as effectively muffling the orifice noise. This allows the compressor noise to be adapted to the noise level of the other operations of the fuel cell drive so that it is not perceived as an unpleasant background noise.

[0008]

According to a special embodiment of the invention, the air intake running into the casing is provided with an air filter. Filtering of the air is necessary, e.g., in internal combustion machines or fuel cell drives. The air filter is generally provided in a housing that contributes itself, as an acoustic volume, to muffling of intake noise. The housing can be individually executed or integrated into the casing or the volume surrounded by the casing.

[0009]

Another advantageous embodiment of the invention results if other noise-emitting components are housed in the casing, in addition to the air suction machine. This can reduce the total noise of the functional group, that can be, e.g., a motor vehicle. The casing functions in this instance in its noise-muffling and noise-absorbing capacity. Examples of the noise-emitting components can be turbochargers or electromotors.

[0010]

A significant embodiment of the invention provides for the resonance chamber to function as a series resonator. This means that the air intake empties into the volume formed by the casing and that the air suction machine comprises for its part an intake opening. As a result, the aspirated air must pass through the resonance chamber. Another possibility provides for the resonator to be used as a parallel resonator. In this instance the intake path of the air from the air intake to the air suction machine substantially forms a continuous conduit system that must comprise as many openings to the resonance chamber as needed to be able to communicate with it acoustically. Naturally, construction variants are conceivable between the described series resonator or parallel resonator operational modes, the described effects being superposed in these variants. This is conceivable, e.g., if the inlet opening of the air suction machine and the outlet opening of the air intake are arranged closely enough to one another that only a slot leading to the resonance chamber remains between these two openings.

[0011]

It is advantageous to provide the air suction machine with a safety filter that can be arranged at its inlet located in the resonance chamber. Dirt particles that enter the resonance

chamber due to leakiness of the casing, in spite of the previous filtering of the aspirated air, can be separated out by the safety filter. This increases the reliability of the entire assembly, and the requirements for the tightness of the casing are lessened.

[0012]

Another possibility for protecting the air suction machine from dirt particles in the resonance chamber is to arrange a sound-permeable wall in the air intake path that communicates with the resonance chamber. This assures an acoustic communication of the resonance chamber with the air intake path. The sound-permeable wall can be designed to be impermeable to any dirt particles, and thus assumes the function of the safety filter.

[0013]

The sound-permeable wall can even be designed to be absolutely airtight. For example, arranging a membrane in the walls of the intake path can transmit the sonic oscillations from the interior of the intake path to the resonance chamber. Such a membrane is thereby sound-permeable even if an exchange of air between the resonance chamber and the air intake path does not take place.

[0014]

The sound-permeable wall can be formed in particular by a flexible hose built into the air intake path as a line section. It is preferable for this purpose to use hoses with a foam-like structure that are applied onto a support hose that can consist, e.g., of fabric. These hoses constitute a comparatively economical semi-finished product that can be readily integrated into the air intake path. In this way the resonance chamber can be used in the casing without endangering the air suction machine. Moreover, the arrangement of the described hose increases the freedom of geometric shaping in the arrangement of the air suction machine in the casing.

[0015]

These and other features of preferred further developments of the invention are apparent from the claims as well as from the specification and the drawings. The individual features can be realized alone, or severally in the form of sub-combinations, in embodiments of the invention and in other areas, and can represent advantageous embodiments capable of being protected and for which protection is claimed here.

Drawings

[0016]

Other details of the invention are described in the drawings using schematic embodiment examples.

Figure 1 shows a block diagram of a fuel cell drive with a casing functioning as a series resonator.

Figure 2 shows an arrangement according to Figure 1 with a casing functioning as a parallel resonator.

Description of the embodiment examples

[0017]

In assembly 10 according to the invention and comprising at least one compressor 11 and one casing 12, the aspirated air is supplied to membrane stack 13 serving as the energy source for a fuel cell drive. The air passes via intake connection piece 14 into air filter 15 and from there via noise muffler 16 to a line section designated as air intake 17 running through wall 18 of casing 12. The casing wall can consist, e.g., of plastic coated on the inside with an open-cell foam.

[0018]

The casing forms resonance chamber 19 in which various noise-emitting components 20 and the compressor are arranged. The compressor is provided with air inlet 21 provided with safety filter 22. Air inlet 21 and air intake 17 are removed far enough from one another that the aspirated air must pass through resonance chamber 19, which therefore functions as a series resonator.

[0019]

After compression the air is fed via supply line 23 directly to the membrane stack. The air leaves the membrane stack through outlet 24.

[0020]

Figure 2 shows an arrangement of the components already described in Figure 1, which results in resonance chamber 19 being used as a parallel resonator. The intake path of the air before air intake 17 is not shown but can be effected exactly as shown in Figure 1. Air intake 17 is connected to air inlet 21 of compressor 11 by hose 25 whose jacket acts as sound-permeable wall 26. Resonance chamber 19 is connected by this wall in an acoustically active manner to the intake path of the air for compressor 11.

Claims

1. A casing (12) for an air suction machine, in particular a compressor (11) for a fuel cell drive, this machine being completely surrounded by the casing, characterized in that the casing is sealed off from the environment, as a result of which a resonance chamber (19) is formed that communicates with the air intake path of the machine and the air intake (17) of the machine is guided through a wall (18) of the casing.

2. An assembly comprising a casing (12) into which an air suction machine, in particular a compressor (11) for a fuel cell drive is fitted, characterized in that the casing is sealed off from the environment, as a result of which a resonance chamber (19) is formed that communicates with the air intake path of the machine and that an air intake (17) of the machine is guided through a wall (18) of the casing.

3. The assembly according to Claim 2, characterized in that the air intake (17) is provided with an air filter (15).

4. The assembly according to Claim 2 or 3, characterized in that other noise-emitting components (20) are housed in the casing (12) in addition to the air suction machine.

5. The assembly according to one of Claims 2 to 4 characterized in that the resonance chamber is designed as a series resonator with regard to the intake path of the air suction machine.

6. The assembly according to Claim 5, characterized in that the air suction machine is provided with a safety filter in the part of the air intake path connected to this machine and located in the resonance chamber.

7. The assembly according to one of Claims 2 to 4, characterized in that the resonance chamber is designed as a parallel resonator with regard to the intake path of the air suction machine.

8. The assembly according to Claim 7, characterized in that the resonance chamber is separated from the air intake path by a sound-permeable wall (26).

9. The assembly according to Claim 8, characterized in that the sound-permeable wall (26) is airtight, so that a complete seal is created between the resonance chamber and the air intake path.

10. The assembly according to Claim 9, characterized in that the sound-permeable wall is formed by a flexible hose (25) that constitutes a line section of the air intake path.

11. The assembly according to one of the previous claims, characterized in that the casing is jacketed on the inside with a sound-absorbing material, especially with an open-pore plastic foam.

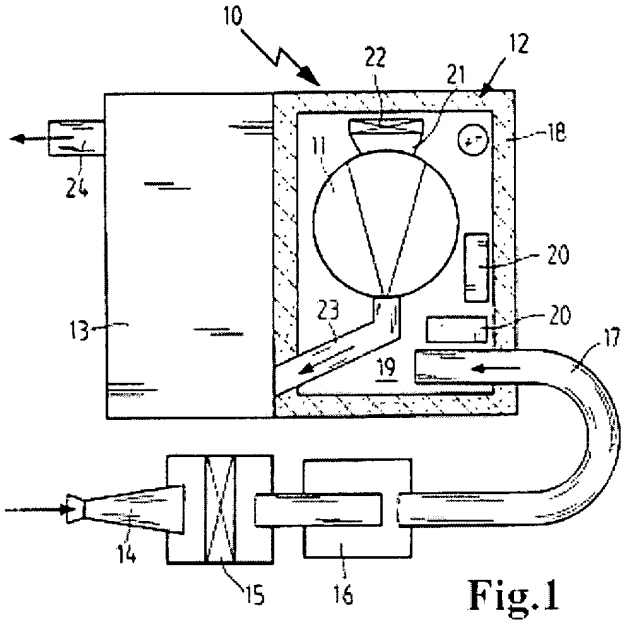
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Fig.1

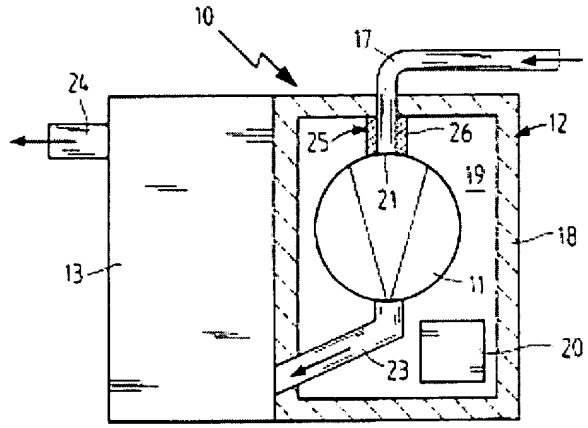
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Fig.2

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Abstract

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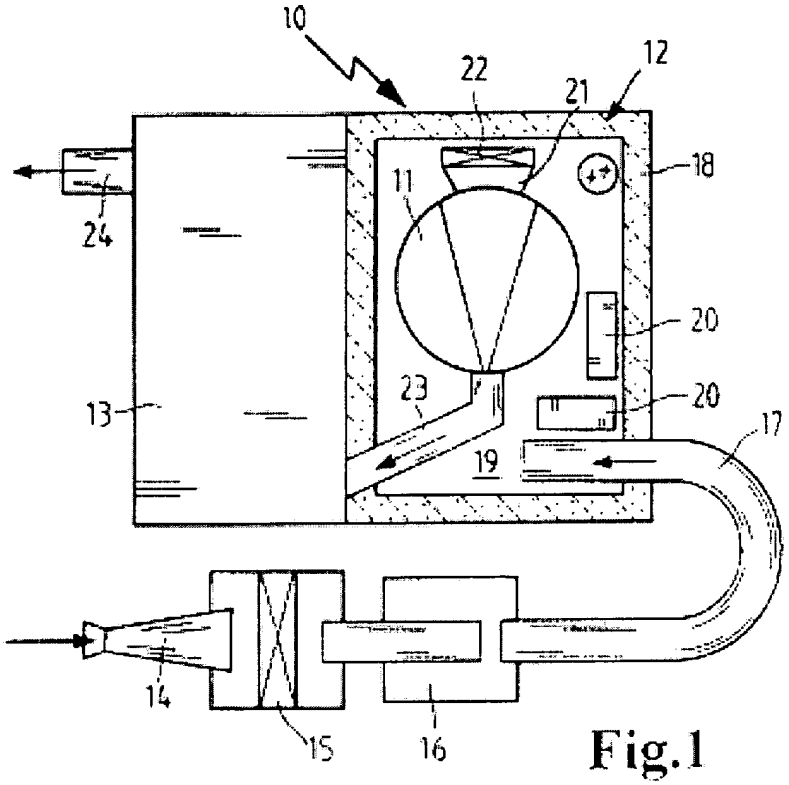

Fig.1

European Patent Office

Application Number EP 01 10 9426

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.[7])
A	US 5,538,404 A (MICHAEL A DIFLORA ET AL.) July 23, 1996 (7/23/1996) * column 4, line 58 – column 6, line 6; figures *	1,2	F02B77/13 F04B39/00 F04D29/66 G10K11/16 G10K11/172
A	PATENT ABSTRACTS OF JAPAN Vol. 1999, No. 11, September 30, 1999 (9/30/1999) * JP 11 173268 A (Mitsubishi Heavy Ind Ltd), June 29, 1999 (6/29/1999) * abstract *	1,2	
A	US 4, 492,533 A (KAZUO TSUGE) January 8, 1985 (1/8/1985) * column 2, line 40 – column 4, line 60; figures *	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl.[7]) F04B F04D G10K
A	US 5,837 393 A (TAKAFUMI OKAMOTO) November 17, 1998 (11/17/1998)		
A	DE 38 31 703 C (PETER WILMS) March 8, 1990 (3/8/1990)		
The present search report has been drawn up for all claims.			

Place of search	Date of completion of the search	Examiner
THE HAGUE	October 10, 2002	von Arx, H

CATEGORY OF CITED DOCUMENTS

X: Particularly relevant if taken alone.
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APPENDIX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 10 9426

In this appendix, the patent family members of patent documents listed in the above-referenced European Search Report are indicated.

The data on the family members correspond to the state of the files of the European Patent Office on October 10, 2002

These data serve only for information and are given without guarantee.

Patent document listed in the search report	Date of publication	Member(s) of the patent family	Date of publication
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		EP 0360048 A2	28-03-1990

For additional details regarding this Appendix: see Official Journal of the European Patent Office No. 12/82